or the water that another must drink

Times: Chicago, Sunday, May 8, 1881.—Quadrupl

SANITATION'S PLEA.

A Discussion of the Methods of Removing Organic Refuse from Places of Habitation.

New Evidence of the Dangers Attending Imperfect Sewerage and Defective House Drainage.

Local Sanitary Matters.

REMOVAL OF ORGANIC REFUSE.

The paper on "The Necessity and Means of Removing Organic Refuse from Inhabited Places," by Dr. O. W. Wight, commissioner of health in Milwaukee, was as follows:

Dr. Buchanan, in England, and Dr. Bowditch, in the United States, simultaneously demonstrated that wetness of soil is at least the exciting cause of phthisis. Surface accumulations of water are not only inconvenient and unsightly, but also disagreeable and unhealthy. Sub-soil dampness makes the site of any habitation incompatible with comfort and duration of life. Therefore, the first care in the preparation of the abodes of man, and, it might be added of domestic animals, should be the drainage of the soil. Removal of water from beneath and around the house and outbuildings increases warmth, fertility, and wholesomeness. What is true in this respect of an isolated habitation, is also true of collections of habitations in the village, and groups of villages constituting the city.

Whatever engineering device is employed for draining the soil and removing rainfall should be used exclusively for the conveyance of water uncontaminated with putrescible organic matter. Such water may then be safely discharged into any convenient natural reservoir, or adjacent stream, where economy and security from flood may dictate. For removing storm water, surface water, and sub-soil water from the isolated habitation, neatly-constructed ditches, agricultural tiles properly laid, and occasional deep drains of porous brick will be sufficient. In villages, well-paved gutters, with more frequent and larger deep drains of porous brick will be needed. In cities, brick mains, adapted in size to the areas from which the water is to be removed, must be added. A suitable size for the site of an isolated habitation, with its out-buildings, in the country, may be regarded as about three hundred feet square. The annual rainfall on that area, at the fair estimate of thirty-six inches, would amount to 270,000 cubic feet. The annual rainfall on a square mile, the average size of a village, would be nearly 84,000,000 cubic feet. On ten square miles, the area of a considerable city, the annual rainfall would be more than 836,000,000 cubic feet. On a city of ten square miles more than 20,000,000 cubic feet of rain may be precipitated from the clouds in a single hour. These figures show that the drainage system of inhabited places should be adequate, as well as adapted to the desired end. Details belong, more especially, to the engineer, but he should know exactly what he is required to accomplish; his art only furnishes the means to an end pointed out by sanitary science.

It is an imperative law, which can not be violated with impunity, that organic wastes of every kind must be removed from inhabited places before the process of putrefaction begins. The excrements of man and the domestic animals, the refuse of manufacturing processes, garbage, offal, wash-water, kitchen-slops, decaying vegetable or animal matter, whether liquid or solid, must be carried to some place where the same

CAN NOT CONTAMINATE THE AIR

breathed by man, pollute the water which he drinks, nor infect the food which he eats. As the excreta from the kidneys and intestines of a thousand human beings in a community amount to more than a ton each day, it follows that the annual product of the this kind in a city of one hundred thousand inhabitants is about forty thousand tons. The higher the organization of the animal the more poisonous are the excreta in a state of putrefaction. Domestic animals contribute a varying quantity, as a greater or less number of them are required for luxury or industrial use, according to the pursuits and habits of the people in different localities. The waste of kitchens is only second in importance to the excreta of human beings and the domestic animals. Distilleries, breweries, tanneries, slaughter-houses, gas-works, various factories, produce more or less liquid or solid organic matter in different cities. The putrescible matter of street-sweepings really belongs in the category of animal excreta.

Now, it is very evident that all solid organic refuse, such as garbage, offal, and manure, must be removed by cartage. No system of water-carriage can be devised which will answer the purpose. Portions of garbage, offal, etc., if properly managed, may be economically fed to ducks, geese, chickens, fishes, or swine. The rest must be returned to the land for fertilization, except in places, like New Orleans, where there is no land and a great river may safely receive all that is given to it. Where there is neither land nor mighty stream, a perpetual fire must swiftly do the sanitary work of oxidation. Here, again, details must be left to the engineer, supplemented by the practical economist; only, the engineer and the economist must not at all interfere with sanitary ends. The most difficult problem of all is to get safely rid of liquid organic refuse, that is, of water containing putrescible matter in solution or suspension. Engineers, who are quacks in sanitation, and sanitarians who are quacks in engineering, have practiced running it into the drainage systems of inhabited places. In fact, this has been the plan generally adopted, till quite recently Col. Waring, who is both engineer and sanitarian, has been bold enough and enlightened enough to put in practice a plan that was previously little more than a timidly-advocated theory. To the great detriment and cost of the public, the sewerage systems adopted in towns are determined by men who are profoundly ignorant of both sanitation and engineering.

The prevalent practice of removing sewage by means of the water drainage system of inhabited places is open to many and

VERY SERIOUS OBJECTIONS.

1. Ditches, gutters, tiles, and porous brick conduits for removing surface and sub-soil water are comparatively cheap. It adds immensely to the cost to transform water drains into sewers, so as to make them at all fit to convey liquid wastes. The combined expense of a separate drainage system and an independent sewer system is much less than the expense of a single system that can not be so constructed as to perform well the double service of removing water from the soil and liquid refuse from habitations.

2. In most places it is not difficult to find a proper outfall for the water of a drainage system. As soon as sewage is mixed with the flow of drains the whole mass is contaminated, and the trouble and cost of securing a safe outfall are, as a rule, greatly increased. The necessity of pumping vast quantities of rain-water and sub-soil water, mingled with the liquid refuse of houses and factories in the same system in the new sewerage-works of Berlin and Dantzig increases the running expense to an extent threatening failure.

3. The sewage proper of a city is nearly a constant quantity. It is approximately measured by the amount of water daily used in houses and factories. Consequently, the engineer in constructing a system for the removal of sewage proper can adapt it to a constant flow and make it self-cleansing. On the contrary, rainfall is an immensely variable quantity. A drainage system for its removal must be of maximum size. When sewage, therefore, is turned into the drainage system, a slow flow will be inevitable much of the time, resulting in putrefaction and the generation of sewer-gas, the presence of which within the area of inhabited places dangerously violates the most vital law of sanitation.

4. In the drainage system all conduits are purposely made to let water in. The object is to convey water away from the soil. But a porous drain will strain sewage through into the earth, and gradually pollute it. Consequently, a conduit for the conveyance of sewage must be made tight. Hence the absolute incompatability of the two ends sought in the same structure. A good sewer is a bad drain. A good drain is a dangerous sewer. Attempts are constantly renewed to attain the double quality of perviousness without and imperviousness within, with unceasing and inevitable failure. Sanitarians who are quacks in engineering have tried it in vain. Engineers who are quacks in sanitation have tried it equally in vain. Quacks in both engineering and sanitation, always well represented in city boards of public works, obstinately keep up their search for the unattainable, like the seekers of the philosopher's stone and the inventers of perpetual motion.

5. Water stored in cisterns is almost invariably poisoned by the way of overflow pipes which discharge into the sewer system of inhabited places and return the dangerous gas. And the drain-pipes from cellars and basements generally furnish avenues through which this invisible foe of human life in cities finds easy ingress to habitations. A separate drainage system affords an easy means of guarding against peril from such a source. Sanitary inspectors are often astounded by finding a tube from an ice-box, in which choice and delicate food, like meats and milk, is kept, running directly into a sewer-pipe. The combined sanitary and engineering quack will tell you, with pitiful ignorance, that the deadly sewer-gas is kept out by means of a little water-trap through which a baby could blow with a straw. A separate system, used exclusively for sewage, is the only certain safety against such danger.

6. With the clumsy, costly, perilous, combined system in general use for removing water and sewage together, the earth of towns gradually becomes infected with organic matter in a state of putrescence. Hence the water of springs and wells at length becomes polluted and unfit for use. With a separate, properly constructed and properly managed system of impervious pipes for the removal of all sewage, and with other sound sanitary regulations for the care and removal of solid organic refuse, there is no reason why the spring-water and well-water of towns should not remain clean and wholesome. Besides, when the earth of inhabited places is kept so clean as to preserve the purity of the water, no exhalations will arise from it deleterious to health and dangerous to life.

GOOD SEWERAGE AND DRAINAGE.

This is not the place to describe in detail the separate sewer systems for the removal of liquid organic wastes from inhabited places. The engineer must conform to the requirements of sanitary science. Any system will be faulty which allows sewage to putrefy at all, either in its scource, on its journey from human abodes, or in its outfall. The plumber must use only good material, his workmanship must be skillful, and he must adapt his art to the ends of sanitation. All soil-pipes must be of iron, lead-jointed, and not only imperious to water, but also to gas. Soil-pipes should be carried up through the roof, with undiminished caliber, and be open at the end. Foot-ventilation never should be omitted. Traps should be as near perfect as known mechanical contrivances can make them. No pains should be spared to ventilate all waste pipes. Proprietor, architect, and plumber should be held conjointly responsible for sewer-gas in or around any habitation. Common sewer-pipes in the public streets should be impervious to both water and gas. Engineers and contractors, as well as the authorities ordering public works, should be held responsible for the quality of the material used and for the skill and honesty of construction. Too much pains can not be taken to make the sewer system of a town as near faultless as possible. The outfall is a matter of great moment, it may be, exceptionally, into a great river, as at Detroit or Memphis. Generally it will be best to return sewage to the land for disinfection and fertilization. Whether surface irrigation, or intermittent downward filtration, or a combination of these methods, will be best in a given instance, must be determined by sound engineering and sanitary judgment.

The great principle to be kept in view is the removal of sewage (not sewage diluted with vast quantities of surface and subsoil water) without pollution of the soil, without putrefaction, and consequently without generation of sewer-gas on the journey.

The entire excreta of human beings may be admitted to the sewerage system for water-carriage. The privy vault should not be tolerated in any civilized neighborhood. Where there is no sewer system some form of earth closet ought to be used, and the contents frequently removed. The liquid portion of the excreta of horses and other domestic animals should be constantly removed by the sewer system. The solid portion should not be thrown upon the ground and bleached by rain, but be kept under cover, dry, and frequently carted away. In fact, no organic matter should be thrown on the ground, nor deposited in the ground near human habitations. The soil where man dwells is sacred, and it is sanitary sacrilege to pollute it. He who fouls the air that he breathes himself, or the water that he drinks, or the food that he eats, is a barbarian who might learn wisdom from the cat or decency from any swine not demoralized by contact with man. He who fouls the air that another must breathe, or the food that another must eat, is a criminal, to be classed with those who maim and kill.

There are more reasons for such care in the removal of organic wastes from inhabited places than appear on the surface. The chemistry and hygiene of putrefaction are complex, involving many practical considerations. Wherever there is a collection of putrefying organic matter, whether on the ground, in the ground, within a faulty sewer, or under a habitation, there is

A TIRELESS FOE

to health and life. Not only are putrescent collections of garbage, decaying vegetables, manure, offal, and human excreta harmful in themselves by reason of exhalations poisoning the air and leeching liquids polluting the earth; they are also depositories and multipliers of disease germs. Such collections may not produce infectious diseases *de novo*, but they lessen the vitality of people living in the neighborhood, and thereby lessen the power of resisting epidemics. It is a well-known pathological fact that nature struggles to eliminate disease by excretory processes. Accumulations of filth containing excreta may therefore harbor seeds of various communicable maladies. Sewer-gas, while it may not beget scarlatina, diphtheria, small-pox, and other contagious diseases, easily becomes the vehicle of conveying them, through obscure and intricate channels. Nor is this all. It is well known that a dung-heap will take cholera, hold it for an indefinite period, and convey it to human beings; that is, cholera dejecta thrown upon a dung-heap will plant in it the germs of the disease, there to take root and multiply, and may communicate themselves to man under favoring circumstances. A privy vault will take typhoid-fever, have it badly for a long time, and communicate the disease to human beings. It is probable that a heap of putrescent garbage may catch diphtheria in the same way, multiply its germs, and communicate them to unsuspecting children. There is little doubt that every seething mass of organic matter is affected with yellow fever in the midst of an epidemic of that disease. It is believed by many experienced physicians that yellow fever is not communicated from person to person, but is always caught from surrounding objects.

So great is the influence of filth in these various ways that no epidemic can make any serious headway in the midst of cleanliness. One frequented privy vault, down with typhoid fever, is more dangerous than a house full of human patients. A big trunk full of dirty clothes, sick with yellow fever, is more to be shunned than a small hospital full of human victims of the disease. A village dung-hill, planted with cholera, is more perilous than a dozen cholera corpses. A foul sewer, swarming with scarlatina germs, may be more dangerous to a neighborhood than an infected school-house.

It has been objected in relation to

SEPARATE SYSTEMS

for drainage and the removal of sewage, that droppings of horses and other animals in the streets, steeping in the rainfall, will be a source of pollution to surface water, rendering it putrescible, and consequently capable of generating sewer-gas. The simple and effective remedy is cleaning the streets frequently and well. Most cities would thereby be greatly improved, both in appearance and salubrity.

It has also been objected, that in quarters where the vitrified pipe sewer system for the removal of sewage does not extend, there the inhabitants must throw the liquid wastes of household life upon the ground. No such necessity exists. Even an isolated habitation in the country should have its sewer-pipes, and entirely separate from the drainage system, to convey kitchen sloops, wash water, and other dangerous liquids to a place of safety. The reason why typhoid fever, diphtheria, and some other filth diseases are so prevalent in country districts is that privy-vaults so frequently seep into wells, and animal excreta of pig-pens and stables are left to poison the earth and the air. The ground about kitchens, supersaturated with slops, very often becomes putrescent in the summer warmth, breeding disease which superstitious ignorance attributes to heaven. A householder may dispense with his parlor and its ornaments, if necessary, but he can not afford to invite upon himself and family disease and death, by neglecting to provide the means of keeping the site of his habitation dry and clean. *Laborare est orare*, —"to labor is to pray."—said the wise old monk, and the most effective prayer for health is to supply every needed hygienic device for the sacred home of the family.

It is further objected that most of our cities are already sewered for the double purpose of removing storm water and sewage through the same conduits, and that we can not afford to do the costly work over again. It is one of the fates of progress that faulty methods must be followed by reconstruction. No works last forever; and when we build anew we can do it better. In the mean time, the faulty old sewers, with their dangerous debouchement into the nearest streams, lakes, or ocean harbors, can be washed out, disinfected, and used exclusively for water-drainage, while a supplementary system, with safe outfall, for the removal of sewage alone, is constructed with proper engineering skill under the direction of sanitary science. The cost of such a supplementary system is not more than one-tenth of that of the prevailing sustem.

MANY OBSTACLES

lie in the way, which must be overcome by effort and conflict. In the first place, civil engineers must be taught enough sanitary science to make them understand the limitations of their own sanitary ignorance. Otherwise, they will continue to use their large influence with town authorities to persist in making costly fine sewers that are not and can not be adapted to the incompatible double purpose of removing storm water and sewage; just as architects persevere in constructing monumental hospitals in defiance of medical, surgical, and hygienic requirements.

In the next place, the inertia of popular ignorance, and apathy, and the conservative resistance of innovation, must be met and conquered. At the outset, the sanitary teacher and preacher is the sole reliance. His services can never be dispensed with. Especial treatises, the proceedings of sanitary associations, and, above all, the constant reiteration of hygienic facts in the periodic press, are rapidly creating a public opinion which will be irresistible. The family doctor is already looking for the causes of diseases in the sanitary surroundings of habitations. The servant of Christ, like the good Bishop Ireland, begins to instruct his flock to observe cleanliness, as well as to pray, in order to avert the wrath of God in epidemics.

Finally, a public sanitary conscience must be created by the enactment and enforcement of wise sanitary laws. "I have given it as my deliberate opinion," says Alexander Baine, "that authority or punishment is the commencement of that state of mind recognized under the various names of conscience, the moral sense, the sentiment of obligation. The major part of every community adopt certain rules of conduct necessary for the common preservation of, or ministering to, the common well-being. They find it not merely their interest, but the very condition of their existence, to observe a certain number of maxims of self-restraint and of respect to one another's feelings on such points as person, property, and good name. Obedience must be spontaneous on the part of the larger number, or on those whose influence preponderates in the society; as regards the rest, compulsion must be brought to bear."

It is not proposed that "those whose influence preponderates" shall constrain the rest to adopt a particular sewerage system, but that they shall compel, by wise and regular administration, the general observance of sanitary laws for the common good. "Compulsion must be brought to bear" to secure respect for health and life, as well as for property and good name. The recent experience of England and of certain cities in the United States clearly demonstrates that enlightened public opinion fully sustains the judicial enforcement of sanitary codes.